



July 14, 2006

Kathleen C. DeMeter, Director
Office of Defects Investigation
NHTSA Enforcement
Room #5326
400 Seventh Street, S.W.
Washington, D.C. 20590

GM-681A Complete

NVS-212.pco
EA06-001

Dear Ms. DeMeter:

This letter is General Motors (GM) Complete response to your information request (IR), dated April 5, 2006 regarding allegations of sunroof glass fracture while driving on certain model year (MY) 2004–2006 Cadillac SRX vehicles manufactured by GM. At your request, GM provided production, field report and warranty information in advance of this response on June 19, 2006.

For this response, GM is providing any new information that is responsive to each question. This response does not contain information GM has already provided in response to PE05-052. This response does contain information related to all three Ultraview glass roof panels and MY 2006 vehicles, which were added to the scope of EA06-001.

Your questions and our corresponding replies are as follows:

8. Describe all assessments, analyses, tests, test results, studies, surveys, simulations, investigations, inquiries and/or evaluations (collectively, "actions") that relate to, or may relate to, the alleged defect in the subject vehicles that have been conducted, are being conducted, are planned, or are being planned by, or for, GM. For each such action, provide the following information:
- Action title or identifier;
 - The actual or planned start date;
 - The actual or expected end date;
 - Brief summary of the subject and objective of the action;
 - Engineering group(s)/supplier(s) responsible for designing and for conducting the action; and
 - A brief summary of the findings and/or conclusions resulting from the action.

For each action identified, provide copies of all documents related to the action, regardless of whether the documents are in interim, draft, or final form. Organize the documents chronologically by action.

Table 8A below summarizes any actions performed by GM, the tier 1 supplier of the Ultraview and Ultraview Plus sunroof modules, and the tier 2 glass supplier during product development and regular production for the middle and rear glass roof panels. Only regular production actions performed for the front panel since GM's response to PE05-052 are included in this response. Documents and additional supporting information related to these actions are provided in the attachments as noted in the table.

PRODUCT ANALYSIS, DEVELOPMENT, VALIDATION AND PRODUCTION ACTIONS – GM681A

<p>Action (8a): Develop PFMEAs for Middle and Rear Panels Start Date: 07/1996 End Date: 10/2004 Engineering Group: Tier 2 glass supplier Attachments: Attachment 4 CD Supplier Confidential Complete, folder labeled "Response for Q8;" refer to sub-folder labeled "Middle Panel ADV" and "Rear Panel ADV" respectively. Description: Copy of PFMEA for middle and rear panels of sunroof module subassembly. Summary of Action: PFMEAs completed by Tier 2 glass supplier.</p>
<p>Action (8b): Develop Process Flow Plans Start Date: 08/1996 End Date: 10/2004 Engineering Group: Tier 2 glass supplier Attachments: Attachment 4 CD Supplier Confidential Complete, folder labeled "Response for Q8;" refer to sub-folder labeled "Middle Panel ADV" and "Rear Panel ADV" respectively. Description: Copy of process flow plans for middle and rear panels of sunroof module assemblies. Summary of Action: Process flow plans completed by Tier 2 glass supplier.</p>
<p>Action (8c): Develop Process Control Plan for Middle and Rear Panels Start Date: 11/1996 End Date: 05/2006 Engineering Group: Tier 2 glass supplier Attachments: Attachment 4 CD Supplier Confidential Complete, folder labeled "Response for Q8;" refer to sub-folder labeled "Middle Panel ADV" and "Rear Panel ADV" respectively. Description: Copy of process control plan for middle sunroof module assemblies. Summary of Action: Process control plan completed by Tier 2 glass supplier.</p>
<p>Action (8d): Complete Production Part Approval Process (PPAP) Testing for Middle and Rear Panels Start Date: 08/28/2001 End Date: 07/15/2003 Engineering Group: Tier 1 sunroof module supplier Attachments: Information not provided with this response; information already provided in GM681 Response in Attachment 4 CD Supplier Confidential. Description: Copies of PPAP approval testing reports for sunroof module subassemblies. Summary of Action: PPAP approval testing completed satisfactorily.</p>
<p>Action (8e): Complete Initial Product (IP) Testing for Middle and Rear Panels Start Date: 03/09/2004 End Date: 06/14/2004 Engineering Group: Tier 2 glass roof panel manufacturer Attachments: Information not provided with this response; information already provided in GM681 Response in Attachment 4 CD Supplier Confidential. Description: Copies of IP testing reports for sunroof module subassemblies. Summary of Action: IP testing completed without incident of glass fracture.</p>
<p>Action (8f): FMVSS 205 Glass Certification Testing for Middle and Rear Panels Start Date: various, see attached End Date: various, see attached Engineering Group: Tier 2 Glass Supplier Attachments: Attachment 3 CD Supplier Complete, folder labeled "Response for Q8;" refer to sub-folder labeled "Middle Panel Cert" and "Rear Panel Cert" respectively. Description: Copies of FMVSS 205 compliance testing reports submitted by Tier 2 to Tier 1 supplier. Summary of Action: FMVSS compliance demonstrated.</p>
<p>Action (8g): FMVSS 205 Glass Certification Start Date: various, see attached End Date: various, see attached Engineering Group: Tier 1 sunroof module supplier, GM Engineering Attachments: Attachment 1 CD GM Complete, folder labeled "Response for Q9" Description: Copies of FMVSS 205 compliance letters submitted by Tier 1 to GM. Summary of Action: FMVSS compliance documentation filed.</p>
<p>Action (8h): Conduct Glass Panel Fragmentation Tests As Prescribed in Production Control Plan – Middle and Rear Panels Start Date: 03/22/2003 End Date: 12/08/2005 Engineering Group: Tier 2 Glass Supplier Attachments: Attachment 4 CD Supplier Confidential Complete, folder labeled "Response for Q8;" refer to subfolder labeled "Fragmentation Tests – Middle and Rear" Description: Copy of fragmentation reports. Summary of Action: All batches of middle and rear sunroof glass met temper standards.</p>

Action (8l): Conduct Glass Panel Fragmentation Tests As Prescribed in Production Control Plan – Front Panel
 Start Date: 12/2005 (est.)
 End Date: 07/2006 (est.)
 Engineering Group: Tier 2 Glass Supplier
 Attachments: Information will be provided in a supplement response, when available.
 Description: Copy of fragmentation reports.
 Summary of Action: Provide copies of additional fragmentation reports demonstrating compliance to standards.

TABLE 8A

Table 8B below summarizes the additional actions performed by GM, the tier 1 supplier of the Ultraview and Ultraview Plus sunroof modules, and the tier 2 glass roof panel manufacturer since November 15, 2005 when GM responded to PE05-052. Any new documents and additional supporting information are provided in the attachments as noted in the table.

SUMMARY OF ADDITIONAL INVESTIGATION ACTIONS – GM681A

<p>Action (8j): GM Management Review Meetings Start Date: 10/18/2005 End Date: ongoing Engineering Group: GM Product Investigations (PI) Attachments: Attachment 2 CD GM Confidential Complete, folder labeled "Response for Q8" Description: Copy of GM PI presentations to management teams. Summary of Action: GM management teams informed of NHTSA Information request and GM investigation findings.</p>
<p>Action (8k): Field report inquiry for glass fracture, several GM models Start Date: 11/07/2005 End Date: 01/23/2005 (est.) Engineering Group: GM Product Investigations Attachments: Attachment 2 CD GM Confidential Complete, folder labeled "Response for Q8" Description: Copy of data summary. Summary of Action: Report data obtained, however analysis not performed as data considered incomplete without warranty.</p>
<p>Action (8l): Analysis of field return parts (VINs 1GYEE63A [REDACTED] 1GYEE63 [REDACTED], 1GYEE63 [REDACTED] and 1GYDE6 [REDACTED]) Start Date: 12/16/2005 End Date: 07/12/2005 Engineering Group: GM Engineering, Tier 1 & 2 Supplier Attachments: Attachment 1 CD GM Complete and Attachment 3 CD Supplier Complete, folder labeled "Response for Q8" Description: Copy of photo presentation Summary of Action: Analyses of four field return parts indicate fractures caused by external impact to glass.</p>
<p>Action (8m): GM search for any NHTSA complaints regarding sunroof fracture while driving for entire industry Start Date: 01/03/2006 End Date: 01/13/2006 (est.) Engineering Group: GM Product Investigations Attachments: Attachment 1 CD GM Complete, folder labeled "Response for Q8" Description: Copy of search results. Summary of Action: GM search of NHTSA data through 12/08/2005 revealed 150 complaints of sunroof fracture while driving since 1982, none of which allege a crash or serious or moderate injury.</p>
<p>Action (8n): Perform Weibull analyses using field incident data Start Date: 01/03/2006 End Date: 06/29/2006 Engineering Group: GM Product Investigations Attachments: Attachment 2 CD GM Confidential Complete, folder labeled "Response for Q8" Description: Copy of Weibull analysis report. Summary of Action: Weibull analyses completed over 10 months of study have consistently indicated that the occurrence is random and the frequency of glass fracture will remain low.</p>

<p>Action (8o): GM / NHTSA Update Meeting January 18, 2006 Start Date: 01/18/2006 End Date: 01/18/2006 Engineering Group: GM Product Investigations Attachments: Attachment 1 CD GM Complete, folder labeled "Response for Q8" Description: Copy of GM presentation to NHTSA. Summary of Action: NHTSA informed of any new reports of glass fracture, GM's Weibull analysis of the field incidents and GM's assessment of NHTSA complaint history regarding sunroof fracture while driving.</p>
<p>Action (8p): Analysis of glass panel tempering standards and data – middle and rear panels Start Date: 06/12/2006 End Date: 07/14/2006 Engineering Group: Tier 2 Glass Supplier Attachments: Attachment 3 CD Supplier Complete, folder labeled "Response for Q8" Description: Copy of analysis report comparing glass tempering data with temper standards. Summary of Action: All batches of sunroof glass met temper standards.</p>
<p>Action (8q): Analysis of glass panel tempering standards and data since PE-05052– front panel Start Date: 06/12/2006 End Date: 07/17/2006 (est.) Engineering Group: Tier 2 Glass Supplier Attachments: Information will be provided in a supplement response, when available. Description: Copy of report comparing glass tempering data with temper standards. Summary of Action: Issue report documenting analysis of glass tempering data and compliance to standards.</p>
<p>Action (8r): Analysis of float glass impurity standards and data – middle and rear panels, front panel since PE05-052 Start Date: 06/12/2006 End Date: 07/19/2006 (est.) Engineering Group: Tier 2 Glass Supplier Attachments: Information will be provided in a supplement response, when available. Description: Copy of report concerning additional analyses of impurity data now responsive to EA06-001. Summary of Action: Issue report documenting analysis of glass impurity data and compliance to standards.</p>

TABLE 8B

GM and its suppliers request that some of the information provided in response to Question 8, which is stamped "Confidential," and includes engineering drawings, material specifications, technical specifications, and validation plans, be afforded confidential treatment by the NHTSA. These documents, along with the required request for confidentiality letters and affidavits, are contained in Attachment 2 CD GM Confidential and Attachment 4 CD Supplier Confidential. This information is not customarily made public by GM or its suppliers and contains trade secrets and commercial information which is privileged or confidential under 5 U.S.C. Section 552(b)(4), 49 CFR Part 512 and 49 U.S.C Section 30167(a).

9. Describe all modifications or changes made by, or on behalf of, GM in the design, material composition, manufacture, quality control, supply, or installation of the subject component, from the start of production to date, which relate to, or may relate to, the alleged defect in the subject vehicles. For each such modification or change, provide the following information:
 - a. The date or approximate date on which the modification or change was incorporated into vehicle production;
 - b. A detailed description of the modification or change;
 - c. The reason(s) for the modification or change;
 - d. The part numbers (service and engineering) of the original component;
 - e. The part number (service and engineering) of the modified component;
 - f. Whether the original unmodified component was withdrawn from production and/or sale, and if so, when;
 - g. When the modified component was made available as a service component; and

- h. Whether the modified component can be interchanged with earlier production components.**

Also, provide the above information for any modification or change that GM is aware of which may be incorporated into vehicle production within the next 120 days.

GM has made no product engineering changes to any of the three glass roof panels that relate or may relate to glass fracture. Furthermore, neither GM, nor the Ultraview sunroof supplier is planning to incorporate any modifications or changes into production of the subject vehicles that relate to the alleged defect within the next 120 days.

11. For each glass module utilized in the subject vehicle, provide the following information:

- a. **Formal item name;**
- b. **Common item name;**
- c. **Movable or Fixed glass module system;**
- d. **Single or multiple sections (state no. of sections) glass panel in movable roof system;**
- e. **Type of movable glass module deployment design (i.e., Slide-in-Roof; Tilted and Slide over roof; Tilted, Slide and Stacked (for sectioned design), etc...);**
- f. **Interior opening beneath glass module area (length x width);**
- g. **Location of glass module (i.e., "over 1st-row occupants", "over 2nd-row occupants", "over 1st & 2nd-row occupants," etc...);**
- h. **Size of module (length x width across roof in inches);**
- i. **Thickness of glass (mil inch);**
- j. **Weight of glass module (pounds);**
- k. **Type of glass used (i.e., laminated, tempered, tempered-laminated, multiple glazed unit, rigid plastics, etc... as classified in ANSI/SAE Z26.1)**
- l. **Certified to ANSI/SAE Z26.1, Item 3/4 Glazing Material Standard (specify all applicable Table 1 Tests);**
- m. **Provide any impact test results per ANSI/SAE Z26.1 Test No. 6-14 or per other standards if available; and**
- n. **ANSI/SAE Z26.1 certification marking (i.e., AS1, AS2 etc...) if any**
- o. **Explain the reasons for selecting the type, thickness, and other relevant aspects of the glass used in the subject component in comparison with other types, thicknesses and other relevant aspects of glass, which were considered or which could have been used.**

Two sunroof options were available on the subject vehicles. These two options are formally referred to as the Ultraview large roof module and Ultraview Plus large roof module. They are more commonly referred to as the Ultraview sunroof and Ultraview Plus sunroof, respectively.

Both the Ultraview and Ultraview Plus sunroof modules consist of the same three glass roof panels: a moveable glass roof panel over the first two rows of seats and two smaller stationary glass roof panels that are located at the middle and rear of the vehicle. The Ultraview sunroof option provides occupant viewing through a single interior opening beneath the front panel. The Ultraview Plus option provides occupant viewing through two interior openings, one beneath the front panel and another beneath the rear panel. Neither sunroof option provides viewing through the middle panel. The moveable roof panel on both sunroofs operates as an outer slider design.

The Ultraview and Ultraview Plus sunroofs provide an interior opening beneath the moveable front glass panel of 986.3mm by 631.5mm. The Ultraview Plus sunroof provides an additional

interior opening beneath the rear glass panel of 356.6mm by 597.8mm. The exact location of occupants beneath either opening varies based upon a number of factors including occupant size and seating position. In order to respond to 11(g) GM has developed an interior model that provides the location of a 95th percentile male occupant head form with respect to the moveable sunroof openings seated in the first and second row seats over the full range of seat travel. The third row seating position in this study is not realistic, because there is not enough headroom for a 95th percentile male to sit in the position shown. GM is providing the interior model in Attachment 2 CD GM Confidential Complete, folder labeled "Response for Q11;" refer to the Adobe Acrobat file named "Cadillac SRX OSCAR to DLO Study."

The information requested in 11(h - l) is summarized in Table 11 below.

CADILLAC SRX ULTRAVIEW SUNROOF PHYSICAL DATA

QUESTION / DESCRIPTION	GM RESPONSE
11(h) Size of Panel ⁽¹⁾	80.0cm X 120.0cm front 30.3cm X 77.6cm middle 58.3cm X 77.6cm rear
11(i) Thickness of glass	5.0mm front, 4.0mm middle and 5.0mm rear
11(j) Weight of glass panel (w/out brackets)	12.83kg front, 2.31kg middle and 5.59kg rear
11(k) Type of glass used	ANSI Z26.1 Item 3 Certified Tempered Glass (all three panels)
11(l)	Test 6 – Impact, Ball, 3.05m (10 ft.) Test 7 – Fracture Test Test 8 – Impact, Shot bag, 2.44m (8 ft.)

TABLE 11

⁽¹⁾ Dimensions provided are plan view dimensions and do not account for glass curvature.

The impact test results requested in 11(m) are provided in response to question 8. Please refer to the information provided for action item 8(f) in table 8A.

For item 11(n), GM is providing a photograph of the certification marking that appears on each glass panel used in the Lamella sunroof in Attachment 2 CD Supplier, folder labeled "Response for Q11;" refer to Adobe Acrobat file.

FMVSS 205 requires vehicle manufacturers to use glazing that meets various test requirements depending upon its intended use and location. S2 of Federal Motor Vehicle Safety Standard No. 205 states: "The purpose of this standard is to reduce injuries resulting from impact to glazing surfaces, to ensure a necessary degree of transparency in motor vehicle windows for driver visibility, and to minimize the possibility of occupants being thrown through the vehicle windows in collisions."

GM chose "Item 3" tempered glass for the Ultraview sunroof panels because tempered glass is designed to possess mechanical strength substantially higher than other glazing materials and if broken at any point, because it fractures into small nuggets of glass that have relatively dull edges. For the front and rear panels, which are larger and provide occupant viewing, GM chose to use tempered glass that is 5.0mm thick to ensure the panels provided optimal strength and impact resistance. For the smaller middle panel, which is separated from the interior by the sunroof module frame and headliner, GM chose 4.0mm thick glass as it has proven to offer

adequate strength and durability in its size and configuration. GM and other manufacturers have used tempered glass like that chosen for the Ultraview sunroof in many other applications for decades, because experience has shown it is durable and safe in such applications.

12. Provide photographs showing an exterior top view looking down at the vehicle's entire roof section with the sunroof glass roof panel in the closed and in the fully opened positions. In addition, show wide-angled interior views looking up at the entire roof liner, with all shades opened, with the glass roof panels in the closed and in the fully opened positions. There shall be a minimum of two pictures originating from two opposite angles for both the exterior and interior screen shots. The files shall be in a "JPG" format with a minimum resolution of 2,500 x 2,000 pixels each and 2.0 MB size.

GM is providing a list of the photographs taken in response to this question, along with the requested photographs in Attachment 1 CD GM, folder labeled "Response for Q12;" refer to the Microsoft Word document and JPEG files.

13. Furnish GM's assessment of the alleged defect in the subject vehicle, including:

- a. The causal or contributory factor(s);
- b. The failure mechanism(s);
- c. The failure mode(s);
- d. The risk to motor vehicle safety that it poses;
- e. The reports included with this inquiry.

GM has studied the rare occurrence of Ultraview sunroof glass fracture while driving for the subject Cadillac SRX vehicles since October 2005 and provided its initial assessment on November 15, 2005 in response to PE05-052. GM remains confident that these fractures are caused by impacts with road debris and do not pose an unreasonable risk of serious injury. Only a small fraction of all impacts with road debris, such as a stone, will result in the fracture of the glass, however certain impacts can cause enough damage to result in immediate fracture or cause a latent fracture.

As indicated in response to question 8, GM has completed additional work related to this investigation since responding to PE05-052. All of this new information is either consistent with GM's initial assessment or provides additional evidence that substantiates GM's conclusions.

GM has searched for new field reports and warranty claims that relate to the fracture of any of the three glass roof panels. This data continues to indicate that glass fracture is the result of random contact with an external object and is occurring at low frequencies for all three panels. GM has used this information to model the expected field performance of the moveable roof panel using Weibull analysis. This analysis also indicates that the events are random in nature and that the frequency of occurrence will remain low through the life of the vehicle.

In November 2005 GM released the first of several ongoing communications to GM dealers nationwide requesting dealers contact certain members of the investigation team before servicing any Cadillac SRX with a fractured glass roof panel. Through this effort, GM and the Tier 1 supplier engineering teams were able to inspect three affected vehicles and retrieve the related glass fragments and frame assemblies. Two of the occurrences involved the moveable roof panel and the third involved the rear panel. Engineering analysis of these components has revealed that impact with a foreign object was the cause of the fracture. Potential defects, such as improper tempering or an inclusion, were not found in any of the three occurrences.

On December 8, 2005, GM searched the NHTSA database for any owner complaints related to fracture of the sunroof for any make and model year vehicle. This search revealed 150 complaints since 1982 of sunroof fracture while driving. GM's review of these complaints indicates that none of these complaints alleged a crash or a moderate or serious injury. Tempered glass has been used in vehicle roofs by many manufacturers for many years and this study confirms that tempered glass is safe and that the likelihood of moderate or serious injury from fractures not caused by crashes and occupant contact is virtually non-existent.

In summary, GM's investigation has shown:

- There is no manufacturing, assembly, or design defect in the SRX sunroof.
- No defect trend exists.
- All the tempered safety glass used in the SRX Ultraview sunroof module glass meets or exceeds the applicable FMVSS 205/ANSI Z26.1 standards for Item 3 glazing material.
- Weibull analyses over the past ten months have consistently shown that the occurrence is random and the frequency of glass fracture will remain low.
- Field data indicates glass fracture occurs at a low frequency and as a result of random, uncontrollable contact with stones and other road debris.
- No crashes or serious or moderate injuries related to SRX sunroof fractures while driving have been identified.
- NHTSA complaint data since 1982 indicates no crashes or serious injury have ever been reported in situations where the sunroof glass fractured while driving.
- Manufacturers have widely chosen tempered glass for sunroofs, a choice provided by FMVSS 205, because it has many safety advantages in that application and excellent performance overall.

GM's conclusion, therefore, is that the alleged safety defect does not exist.

Since GM's response to PE05-052, NHTSA has provided two additional VOQs (10155600 and 10141228) for GM's consideration. Both of these reports allege the moveable glass roof panel fractured while driving and are responsive to this information request.

* * *

This response is based on searches of General Motors Corporation (GM) locations where documents determined to be responsive to your request would ordinarily be found. As a result, the scope of this search did not include, nor could it reasonably include, "all of its divisions, subsidiaries (whether or not incorporated) and affiliated enterprises and all of their headquarters, regional, zone and other offices and their employees, and all agents, contractors, consultants, attorneys and law firms and other persons engaged directly or indirectly (e.g., employee of a consultant) by or under the control of GM (including all business units and persons previously referred to), who are or, in or after September 1, 2003, were involved in any way with any of the following related to the alleged defect in the subject vehicles:

- a. Design, engineering, analysis, modification or production (e.g. quality control);
- b. Testing, assessment or evaluation;
- c. Consideration, or recognition of potential or actual defects, reporting, record-keeping and information management, (e.g., complaints, field reports, warranty information, part sales), analysis, claims, or lawsuits; or

- d. Communication to, from or intended for zone representatives, fleets, dealers, or other field locations, including but not limited to people who have the capacity to obtain information from dealers."

This response was compiled and prepared by this office upon review of the documents produced by various GM locations, and does not include documents generated or received at those GM locations subsequent to their searches.

Please contact me if you require further information about this response or the nature or scope of our searches.

Sincerely,



Gay P. Kent
Director
Product Investigations

Attachments:

- 4 CDs - Attachment 1 CD GM Complete
- Attachment 2 CD GM Confidential Complete
- Attachment 3 CD Supplier Complete
- Attachment 4 CD Supplier Confidential Complete

**GM681A Complete
EA06-001**

GM CONFIDENTIALITY LETTER

**GM CONFIDENTIALITY LETTER HAS BEEN
REMOVED FROM THIS ATTACHMENT AND
SUPPLIED TO
THE OFFICE OF THE CHIEF COUNSEL**

**GM681A Complete
EA06-001**

SUPPLIER CONFIDENTIALITY LETTER

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**GM681A Complete
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ATTACHMENT "1"

GM NON-CONFIDENTIAL MATERIAL

**GM681A Complete
EA06-001**

ATTACHMENT "2"

GM CONFIDENTIAL MATERIAL

**GM CONFIDENTIAL MATERIAL HAS BEEN
REMOVED FROM THIS ATTACHMENT AND
SUPPLIED TO
THE OFFICE OF THE CHIEF COUNSEL**

**GM681A Complete
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ATTACHMENT "3"

SUPPLIER NON-CONFIDENTIAL MATERIAL

**GM681A Complete
EA06-001**

ATTACHMENT "4"

SUPPLIER CONFIDENTIAL MATERIAL

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AND SUPPLIED TO
THE OFFICE OF THE CHIEF COUNSEL**